

U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
California Forest and Range Experiment Station
Division of Forest Insect Research

DOUGLAS-FIR BEETLE
KLAMATH, SHASTA-TRINITY AND SIX RIVERS NATIONAL FORESTS
SPRING 1955
APPRAISAL SURVEYS

INTRODUCTION

In May 1955, two aerial surveys were initiated by the California Forest and Range Experiment Station in cooperation with the California State Division of Forestry and the Administration branch of U. S. Forest Service, to assess the damage due to the Douglas-fir bark beetle (Dendroctonus pseudotsugae). One was an extensive survey of the Douglas-fir region which includes the Hoopa Indian Reservation, and the Klamath, Shasta-Trinity, and Six Rivers National Forests; the other was an intensive survey of the Grouse and Madden Creek drainages on the South Fork Trinity River on the Six Rivers National Forest. The objectives of the extensive survey were to locate any new areas of damage in the Douglas-fir region, and to determine the best location to conduct studies on the habits of this insect. The intensive survey was made to determine the accuracy of the 1954 helicopter appraisal survey by ground checks and to finish the aerial survey of upper Grouse Creek not completed last year.

The first survey of the recent Douglas-fir beetle outbreak in California was conducted in 1954 by Hall, Downing and Eaton. They made a combined aerial and ground appraisal of the Douglas-fir beetle damage and estimated that, as of August of that year, there were 1052 groups of dead and dying Douglas-fir which contained some 103,000,000 bf. of timber ^{1/}.

In September 1954, G. L. Downing made an appraisal survey from a helicopter of the Grouse Creek and Madden Creek drainages on the Six Rivers N. F. ^{2/}. Grouse Creek and Madden Creek are the only drainages where appreciable amounts of beetle-killed Douglas-fir occur on intermingled public and private lands. This September appraisal survey was made to determine the distribution of the infested trees according to ownership as a basis for affixing responsibility for salvage or control in this area. A helicopter was used for this survey because the area is not easily accessible; the terrain is rough and roads are far apart. Groups of infested trees were mapped in place on a USGS topographic map, and the total number of trees (both those that were faded and those without needles) within each group was noted. The acreage surveyed was 47,908 and the number of trees counted - 3,281. The average number of beetle-killed trees per acre was 0.068.

^{1/} Hall, R. C., Eaton, C. B., Downing, G. L. Douglas-fir Beetle, Six Rivers and Klamath National Forests, July 1954. Reconnaissance Survey. California Forest and Range Experiment Station, Berkeley, California. August 6, 1954.

^{2/} Downing, G. L. Douglas-fir Beetle, Lower Trinity District, Six Rivers National Forest. September 1954 Appraisal Survey.

During the winter further investigations were made of Douglas-fir beetle and its habits. A conference was held with Kenneth Wright of the Pacific Northwest Forest Experiment Station to determine what had been learned of the habits of this insect in Washington and Oregon, where concentrated study has been going on for some time. In the Pacific Northwest, according to Wright, the Douglas-fir beetle attacks twice a year - once in the early spring and again in midsummer through August. The spring attacks cause the trees to fade during the summer and fall; the summer attacks caused fading during the winter and spring. The trees that fade in the summer lose their needles during the winter, and once a tree loses its needles it is extremely difficult to distinguish it from a tree which had previously died. Because the trees are tall and the Douglas-fir bark beetle attacks the top first, it is difficult to detect the boring dust from new attacks. It is therefore necessary to await fading before all attacked trees can be identified.

CURRENT LOSS CONDITIONS THROUGHOUT INFESTATION AREA

On May 19 and 20, 1955, G. L. Downing, R. E. Stevens and G. C. Trostle from the Experiment Station conducted the extensive aerial survey of the Douglas-fir sub-region. The areas showing red-topped trees were recorded in two ways: (1) By mapping the intensity of the infestation using colored pencils to differentiate on each drainage light, medium and heavy infestations; (2) by indicating the number of trees per group using letters to denote group size class; for example, A for 1-10 trees, B for 11-30, C for 31-100, and D for over 100 trees.

A comparison of the information gained from this survey with the 1954 infestation map revealed the following new areas of Douglas-fir beetle damage:

Klamath National Forest - Southward in Griden Creen (T45N, R12W MDM) to Cold Springs.

Southward in Elk Creek (T14N, R8E HM) to Bear Creek.

Some light infestation in Sandy Bar Creek (T13N, R6E).

One spot in the head of Haypress Creek (T12N, R7E).

Six Rivers National Forest - A heavy concentration on East Fork of Blae Creek.

Trinity National Forest - The largest and most extensive expansion was noted on the slopes west of the South Fork of the Trinity River. Infested groups were seen the entire length of the drainage from the Yolla Bolly Mts. to Willow Creek.

In seeking a feasible location for conducting studies on the life history of this bark beetle, the northeast corner of the Hoopa Indian Reservation seemed to be the most accessible area where an infestation occurred. The concentration of newly infested material in the South Fork might well warrant some work being done there.

TESTS TO DETERMINE ACCURACY OF HELICOPTER SURVEYS

During the week of April 18-21, 1955, an attempt was made to recheck the Grouse Creek-Madden Creek drainages to determine the accuracy of the aerial survey made last September. However, snow and low clouds made this work impossible. It was found that when the cloud ceiling was too low for helicopter flying, ground observations were not feasible either as the color characteristics of the tree crowns were obscured by the clouds.

On May 10 and 11, better weather conditions prevailed and it was possible to complete this work. Ed Martin from the California State Division of Forestry, and R. C. Hall, G. L. Downing, R. E. Stevens and G. C. Trostle from the California Forest and Range Experiment Station participated in the survey. A Bell helicopter was hired from Aetna Helicopter Service with Bob Trimble as pilot. G. L. Downing handled the aerial phases of the survey while the ground checking was completed by the remainder of the crew.

An area of about 2000 acres, where the infested trees supposedly all had been mapped in September 1954, was chosen for the ground checking. The area selected was one in which ground crews could be easily placed by helicopter. In the procedure followed, two ground crews checked as many groups of infested trees as they could locate; however, no attempt was made to check every group of trees in the area. They recorded the diameter of each tree within the group and classified the tree either as dead (attacked the spring of 1954 or earlier) or currently fading (attacked the summer of 1954). It was soon discovered that the groups had not been mapped accurately enough the previous fall, so the ground checked area was reflown and remapped. The discrepancy in mapping could have been due either to the fact that the survey was completed before all the trees had faded, or because the mapping was done too fast. About 2 hours were required to refly and remap the losses in the 2000 acres.

When both the aerial and ground surveys were completed the two were compared to determine the accuracy of the information obtained from the air. The following are the results:

1. The actual number of fading trees within the groups counted on the ground was 49; the number of trees classified as dead in these groups was 180.
2. The observed number of current fades as mapped from the helicopter in the same groups was 45 and 143 for older dead.
3. In some cases more fading trees were counted from the air than were found on the ground, so the difference between the actual counts and aerial counts of fading trees is 10 rather than 4 as indicated above. The difference between the count on dead trees is the indicated 37. Thus the error in counting either faded or dead trees is about 20 percent.
4. On the entire 2000 acres, 278 dead and 130 currently fading trees were counted from the air; thus the current trees make up 47 percent of total number previously killed.
5. Volumes were determined for 261 trees which averaged 2752 bf. per tree. The average volume of 204 dead trees was 2866 bf., while the average volume of the

57 late attacked trees was 2366 bf. These represent the volume found in Douglas-fir in this area with about a 42" DBH. The difference between the average volumes of the dead and fading trees is not significant. Volumes were determined for some trees where not all the trees in the group were counted; therefore, the volumes were taken on more trees than were used to check the aerial survey.

There existed in Upper Grouse Creek an area which was unsurveyed in 1954. To complete the information on the entire unit this area was flown; the currently fading trees, numbering 307 trees on 11,260 acres, were counted and mapped.

CONCLUSIONS

The important information and conclusions which may be assumed from these two surveys are as follows:

1. Two surveys are needed to analyze any one year's infestation - one in October or November, and the other in the following April or May.
2. Some method of extensive mapping should be used which will indicate the intensity of infestation - either as to number and size of groups or a classification of each small drainage as to the overall intensity of infestation.
3. On Grouse and Madden Creeks the 1954 fall survey indicated there were 4,047 infested trees on 59,240 acres. This fall survey was not over 75% accurate. Correcting for this error would bring the total number of damaged Douglas-fir in these drainages to 5,393.
4. The spring 1955 survey showed that 47% of the trees were currently fading (278 dead, 130 faded). Applying this correction to the entire unit brings the total trees infested by the Douglas-fir beetle to 7,928 or 0.134 trees per acre.
5. The reader should be reminded that even though the estimated number of 1954 infested trees has been increased from 0.068 to 0.134 trees per acre, it is not an indication that the infestation is on the increase. The original figure has only been corrected for the error in the aerial survey and for the infested trees which had not faded at the time of the survey.
6. Using an average volume of 2752 bf. per tree, the average loss per acre equals 369 bf., or a total of 21.86 MM bf. of dead timber in the Grouse Creek and Madden Creek drainages.
7. An appraisal survey can be made from a helicopter mapping infested trees in place with an accuracy of about 80 percent.

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